EPA NEW ENGLAND'S TMDL REVIEW

TMDL: Hampton/Seabrook Harbor, New Hampshire

STATUS: Final

IMPAIRMENT/POLLUTANT: Two assessment units (NHEST600031004-09-01, NHEST600031004-04-03) for fecal coliform bacteria

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BACKGROUND: The New Hampshire Department of Environmental Services (NHDES) submitted to EPA New England a final Total Maximum Daily Load (TMDL) report for Hampton/Seabook Harbor, which consists of a main report (dated August 7, 2003) and supplementary information (Appendix E: Responses to EPA Comments on the Hampton/Seabrook Harbor Bacteria TMDL, dated September 25, 2003). This report gives the maximum allowable bacteria loadings for the harbor that will result in attainment of state water quality standards (WQSs). The following is a summary of EPA's review, which determined that the submission meets statutory and regulatory requirements of TMDLs in accordance with Section 303(d) and 40 CFR Part 130.

REVIEW ELEMENTS OF TMDLs

Section 303(d) of the Clean Water Act (CWA) and EPA's implementing regulations at 40 C.F.R. § 130 describe the statutory and regulatory requirements for approvable TMDLs. The following information is generally necessary for EPA to determine if a submitted TMDL fulfills the legal requirements for approval under Section 303(d) and EPA regulations, and should be included in the submittal package. Use of the verb "must" below denotes information that is required to be submitted because it relates to elements of the TMDL required by the CWA and by regulation.

1. Description of Waterbody, Pollutant of Concern, Pollutant Sources and Priority Ranking

The TMDL analytical document must identify the waterbody as it appears on the State/Tribe's 303(d) list, the pollutant of concern and the priority ranking of the waterbody. The TMDL submittal must include a description of the point and nonpoint sources of the pollutant of concern, including the magnitude and location of the sources. Where it is possible to separate natural background from nonpoint sources, a description of the natural background must be provided, including the magnitude and location of the source(s). Such information is necessary for EPA's review of the load and wasteload allocations which are required by regulation. The TMDL submittal should also contain a description of any important assumptions made in developing the TMDL, such as: (1) the assumed distribution of land use in the watershed; (2) population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources; (3) present and

future growth trends, if taken into consideration in preparing the TMDL; and, (4) explanation and analytical basis for expressing the TMDL through surrogate measures, if applicable. Surrogate measures are parameters such as percent fines and turbidity for sediment impairments, or chlorophyl a and phosphorus loadings for excess algae.

Hampton/Seabrook Harbor, located in the towns of Hampton, Seabrook, and Hampton Falls, is a receiving waterbody for the coastal drainage watershed of New Hampshire. The harbor is surrounded on three sides by salt marshes and on the fourth (eastern edge) by a narrow spit of land. Hydrodynamically, the harbor is characterized by strong tidal flushing (about 88 percent of harbor water on each tide), with tidal exchange occurring through a small gap in the spit on the eastern side.

Soft shell clams (Mya arenaria) are recreationally harvested from three clam flats in the middle of the harbor as well as from smaller flats in the harbor. Classification of growing areas in the harbor was established in accordance with National Shellfish Sanitation Program (NSSP) guidelines and standards. Central harbor areas are "Conditionally approved" for shellfishing, and are open during dry weather, but closed after a rainfall of 0.25 inches from November through May. Currently, all flats are closed by the NH Fish and Game Department in June, July, and August for resource conservation, and in September and October because of frequently elevated bacteria concentrations during these months due to low rainfall and contamination by boat sewage.

The TMDL study was conducted in order to reduce bacteria levels in Hampton/Salem Harbor. The study area included fourteen assessment units (AUs) comprising the central harbor area and eight rivers and creeks which are tributaries to the harbor. Ten of the AUs are on the state's § 303(d) list as impaired or as probably impaired by fecal coliform (FC) bacteria for shellfishing. Two of these 10 AUs are also listed as impaired for primary contact recreation, although this listing is based on reports of sewage discharges and not measured violations of enterococci (bacteria indicator for swimming in tidal waters). A report addendum (Appendix E: Responses to EPA Comments on the Hampton/Seabrook Harbor Bacteria TMDL, dated September 25, 2003) clarifies that the TMDL addresses two of the AU's which comprise the central harbor area (NHEST600031004-09-01 and NHEST600031004-04-03).

All harbor AUs are also listed on NH's § 303(d) list as impaired for fish consumption and shellfishing because of state-wide advisories by NH Department of Health and Human Services for PCB, dioxin, and Hg contamination. The TMDL report reviewed herein, however, only addresses contamination by bacteria.

NHDES identified the following significant National Pollution Discharge Elimination System (NPDES) point sources of bacteria to the harbor: the Hampton wastewater treatment facility (WWTF) and discrete stormwater discharges from municipal separate storm sewer systems (MS4) subject to EPA Phase II Stormwater regulations. The discrete stormwater discharges identified by NHDES include over 100 pipes, streams, creeks, and conveyances around the harbor. For this TMDL, NHDES monitored 16 MS4 stormwater sources to the harbor during two storms (see TMDL Review Element #3). NHDES identified two other minor NPDES permitted

sources to the harbor: EnviroSystems, Inc. and Aquatic Research Organisms, Inc.

Other significant sources of bacteria to the harbor identified by NHDES include dry-weather human sources (e.g., illicit connections and failing septic systems), dry-weather wildlife/natural sources (birds, other wild animals), and stormwater not conveyed through MS4 system (stormwater conveyed via tributaries and overland runoff).

NHDES used microbial source tracking (ribotyping) to distinguish natural from human sources of bacteria in stormwater. This type of study is important for identifying sources that can be controlled and for defining effective control technologies.

For ribotyping analyses, samples were collected from 10 stations at least every 2 weeks from September 2000 through October 2001. Sixty percent of the E. coli isolates in the samples matched ribotypes strains in the source-species database at the University of New Hampshire. Of these, 15 percent were from wildlife sources, 7 percent were from avian (bird) sources, 26 percent were from human sources, 4 percent were from pets, 8 percent were from livestock. These proportions did not vary significantly for wet and dry weather conditions (Table 9 of TMDL report). NHDES concluded from this study that the ratio of human to wild-animal sources of bacteria to the harbor is about 60:40.

In addition, five samples were collected hourly from each of the 2 storm drains during a rainstorm on October 16, 2002. The largest source of bacteria at both pipes was birds, followed by humans and wildlife (Table 10 in TMDL report), with human sources (human, pet, livestock) accounting for 17 and 35 percent of the matched isolates in each pipe, respectively.

NHDES based its calculations of pollutant loadings and the relative contributions from each source category on monitoring data, including data collected specifically for this TMDL study, and on several simple models, including two mass-balance models (see TMDL Review Element #3).

The TMDL submittal contains a description of important assumptions made in developing the TMDL. These include an assumption that the two monitored storms (July and October 2002) can reasonably be expected to represent the range of typical storm loadings. NHDES also assumed that bacteria loading from each of seven tributaries was roughly the same as the loading from one monitored tributary, Mill Creek. Modeling assumptions included the following: (1) dry-weather bacteria sources included only the WWTF, boats, and human and wildlife/natural sources, (2) tidal flushing is main mechanism for removing bacteria from harbor, (3) FC concentrations are relatively constant during dry weather, (4) FC bacteria is added to harbor at a rate about equal to its removal by tidal flushing (i.e., steady-state conditions).

Assessment: EPA New England concludes that the TMDL document adequately characterizes Hampton/Seabrook Harbor, the pollutant of concern, and pollutant sources. NHDES used the best available information, including monitoring data collected specifically for this TMDL. EPA New England agrees that the analytical approach, which relies primarily on monitoring data, is adequate, and that the TMDL includes an adequate description of important assumptions.

2. Description of the Applicable Water Quality Standards and Numeric Water Quality Target

The TMDL submittal must include a description of the applicable State/Tribe water quality standard, including the designated use(s) of the waterbody, the applicable numeric or narrative water quality criterion, and the antidegradation policy. Such information is necessary for EPA's review of the load and wasteload allocations which are required by regulation. A numeric water quality target for the TMDL (a quantitative value used to measure whether or not the applicable water quality standard is attained) must be identified. If the TMDL is based on a target other than a numeric water quality criterion, then a numeric expression, usually site specific, must be developed from a narrative criterion and a description of the process used to derive the target must be included in the submittal.

Tidal waters such as in Hampton/Seabrook Harbor are classified in New Hampshire as Class B waterbodies. WQSs consist of three components: designated uses, criteria, and antidegradation requirements. Three designated uses for tidal waters are relevant to bacteria pollution: shellfishing, primary contact recreation (i.e., swimming), and secondary contact recreation (e.g., boating).

WQSs for shellfishing waters are the NSSP standards, which specify a geometric mean for fecal coliforms of less than 14 MPN/100 ml (MPN is "most probable number") and a 90th percentile of less than 43 MPN/100 ml. In addition, NHDES periodically conducts sanitary surveys for these waters in accord with NSSP guidelines.

For primary contact recreation, tidal waters can contain no more than either the geometric mean of 35 enterococci bacteria per 100 ml (based on at least three samples over a 60-day period) or greater than 104 enterococci per 100 ml in any one sample, unless naturally occurring. There are no WQSs for secondary contact recreation. However, for 303(d) listing, NHDES uses a threshold of enterococci concentrations greater than five times the primary contact recreation standards.

NH's goal for this TMDL study is to meet all WQSs for all designated uses affected by bacteria contamination, using the most stringent WQSs (shellfishing WQSs) as the TMDL target.

Assessment: EPA New England concludes that NHDES has adequately described New Hampshire's WQSs for bacteria as well as a numeric water-quality target for the TMDLs

3. Loading Capacity - Linking Water Quality and Pollutant Sources

As described in EPA guidance, a TMDL identifies the loading capacity of a waterbody for a particular pollutant. EPA regulations define loading capacity as the greatest amount of loading that a water can receive without violating water quality standards (40 C.F.R. § 130.2(f)). The loadings are required to be expressed as either mass-per-time, toxicity or other appropriate measure (40 C.F.R. § 130.2(i)). The TMDL submittal must identify the

waterbody's loading capacity for the applicable pollutant and describe the rationale for the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources. In most instances, this method will be a water quality model. Supporting documentation for the TMDL analysis must also be contained in the submittal, including the basis for assumptions, strengths and weaknesses in the analytical process, results from water quality modeling, etc. Such information is necessary for EPA's review of the load and wasteload allocations which are required by regulation.

In many circumstances, a critical condition must be described and related to physical conditions in the waterbody as part of the analysis of loading capacity (40 C.F.R. § 130.7(c)(1)). The critical condition can be thought of as the "worst case" scenario of environmental conditions in the waterbody in which the loading expressed in the TMDL for the pollutant of concern will continue to meet water quality standards. Critical conditions are the combination of environmental factors (e.g., flow, temperature, etc.) that results in attaining and maintaining the water quality criterion and has an acceptably low frequency of occurrence. Critical conditions are important because they describe the factors that combine to cause a violation of water quality standards and will help in identifying the actions that may have to be undertaken to meet water quality standards.

NHDES used historical and recent monitoring data, supplemented with microbial source-tracking studies and modeling, to identify sources of bacteria to Hampton/Seabrook Harbor and to estimate relative contributions from different source categories. Field data included low-tide data (FC and enterococci concentrations) for the period 1993-2002 collected at ten NSSP stations used by the NHDES shellfish monitoring program (see map of stations in Appendix A, Figure 5 in TMDL report). This database includes data for the months of June, July, and August when flats are closed. To obtain additional information on stormwater sources of bacteria for this TMDL, NHDES monitored 16 storm drains and seven tributaries during storms in July and October 2002.

Water quality relative to shellfishing standards

To characterize current conditions, NHDES calculated both parts of the NSSP shellfishing standard (the geometric mean and the 90th percentile concentration) for each of the 10 NSSP stations (Table 7 in the TMDL report) using year-round samples taken from 1993-2002. For the geometric mean FC concentration, NHDES used both routine and wet-weather samples to calculate a weighted geometric mean FC concentration for various-sized storms. (Weighting factors were used to account for the frequency of days that each storm of a specified size occurred.) As noted by NHDES, elevated concentrations of bacteria typically persist in the harbor for three days due to continued loading from the watershed. This was taken into account by multiplying the number of storm events of each size category by three. The NHDES storm analysis showed that geomean FC concentration increased steadily with increasing amounts of rainfall, with the geomean standard (but not the 90th percentile standard) generally expected to be met everywhere in the central harbor following storms under 0.50 in. (Figure 5 in TMDL report).

To estimate the 90th percentile FC concentration, NHDES used an equation recommended by NSSP (p. 15 of TMDL report). Because this method uses only randomly collected data, different storm sizes were not evaluated.

Over the 10-year reporting period, the geometric mean concentrations of all stations but one were close to the WQS of 14 MPN/100 ml. The only station exceeding the geomean standard is at the mouth of Mill Creek. However, for the 90th percentile concentrations, all stations exceeded the WQS of 43 MPN/100 ml (some only slightly). The high variability of FC within the reporting period is attributed to wet-weather runoff and, possibly, boat discharges. While wet-weather loads are important, dry-weather violations (mainly due to boat discharges) of WQSs also occurred in September and October during the 10-year reporting period, resulting in closure of the clam flats by the DES Shellfish Program during these months.

Water quality relative to swimming standards

From May through September 2001, NHDES collected monthly samples for enterococci from four stations in the central part of the harbor as part of the EPA-funded National Coastal Assessment. The geomean FC concentrations for these stations was 6.2, 9.0, 4.6, and 4.3 cts/100 ml, thus showing compliance with the primary contact recreation (swimming) standard during this period.

Evaluation of bacteria loading

1. Regulated point sources

1a. Hampton WWTF

Based on Discharge Monitoring Reports (DMRs) from 1989 to 2001, NHDES calculated the geometric mean loading rate from the WWTF to be 0.3 bill FC org/day. NHDES notes that the 91% decrease in bacteria loads from the WWTF over the period 1989 to 2001 is due to a decrease in bacteria concentration rather than to decreasing flow. The current permit for this facility (2002-2006) allows a maximum monthly average FC concentration of 14 MPN/100 ml and a daily maximum FC concentration of 43 MPN/100 ml (i.e., the effluent limits have been set based on applying the bacteria criteria at "end-of-pipe."). Taking into account the largest possible flow through this facility, the WWTF is currently permitted to discharge a maximum of 7.7 bill org/day.

1.b. EnviroSystems, Inc. and Aquatic Research Organisms, Inc.

Each of these NPDES-permitted sources contributes a negligible amount of bacteria loading.

1c. Storm drains

NHDES identified Phase II MS4 stormwater discharges as significant sources of bacteria during

and immediately following storms. To estimate the bacteria loads from these sources to the harbor, NHDES sampled 16 stormwater drains that potentially contribute significant amounts of bacteria. Stormwater maps from the Hampton Department of Public Works (DPW) show that the monitored storm drains (Hampton Beach area) channel stormwater discharge from the highly developed area (25-50 percent impervious) south of Ocean Boulevard.

Two types of storms were monitored: (1) a short, intense storm on July 23, 2002 (0.33 in rain over 4 hours), and (2) a soaking rain with high winds on October 16, 2002 (1.39 in rain over 12 hours). EPA agrees with NH's assumption that these two storms can reasonably be expected to represent the range of typical storm loadings. NHDES estimated that the FC load to the harbor during the July storm was 120 billion organisms, and during the October storm was 630 bill orgs. These results confirm that MS4 storm drains can contribute significant bacteria loads to the harbor during storms.

2. Nonpoint sources and non-NPDES point sources

NHDES also estimated loads from existing nonpoint sources and non-NPDES point sources, which, for Hampton/Seabrook Harbor, include (1) discharges from boats in mooring fields or marinas, (2) dry-weather human and wildlife sources, and (3) stormwater not conveyed through MS4 system (e.g., conveyed via tributaries and via overland runoff).

2a. Boats

NHDES conducted two field surveys on August 14 and October 17, 2002 to evaluate potential bacteria loading from boats moored or docked in the harbor. Loading from this source is from releases of untreated sewage. On August 14, all 143 slips at the Hampton River Marina were filled and about 30 boats were in each of the two mooring fields at Hampton River and Seabrook Harbor. On October 17, 52 of the slips at the Marina were filled and 15 boats were in each of the two mooring fields.

According to NHDES, US Food and Drug Administration (FDA) estimated in 2002 that 50 percent of boats in the marina discharge sewage. NHDES notes that moored boats are mainly commercial and operate out at sea; therefore, NHDES assumed that 50 percent of these boats have marine sanitation devices and that 50 percent of those with devices discharge sewage. Therefore, the number of discharging boats ranged from 86 in August to 33 in October. Using NHDES standard procedures for estimating bacteria loads from boats, they estimated 132 to 344 billion FC orgs/day, with an average of 238 bill orgs/day for this period.

2b. Dry-weather human and wildlife/natural sources

NHDES identified possible dry-weather human sources of bacteria to the harbor as including failing septic systems and illicit discharges of wastewater to the stormwater system. (Based on a comment from EPA, NHDES subsequently acknowledged that illicit connections are regulated point source discharges rather than nonpoint discharges.) Wildlife/natural sources are mainly wastes from birds and other wild animals. NHDES used a mass-balance model to analyze

contributions from these sources during dry weather. Model assumptions included assumptions that (1) the only dry-weather bacteria sources are the WWTF and other permitted facilities, boats, and wildlife and human nonpoint sources; (2) tidal flushing is the main mechanism for removing bacteria from harbor; (3) FC concentrations are relatively constant during dry weather; and (4) FC bacteria is added to harbor at a rate about equal to its removal by tidal flushing.

Based on available year-round dry-weather records from 1993-2002, NHDES estimated that the dry-weather geomean FC concentration in the harbor is about 7 MPN/100 ml. Using this estimate, the total export of bacteria by tidal flushing during dry weather is about 2021 bill org/day. Subtracting estimated loadings for the WWTF and boat discharges, NHDES estimated the dry-weather NPS loads to be 1783 bill org/day.

Because microbial source tracking showed the ratio of human to wild-animal sources to be about 60:40 (see TMDL Review Element #1), NHDES estimated the dry-weather human source load at 1070 bill org/day and the dry-weather wild-animal source load at 713 bill org/day.

2c. Stormwater loads from tributaries

Seven major tributaries drain the Hampton/Seabrook Harbor watershed. NHDES monitored each of these tributaries approximately hourly during the storms of July 23 and October 16, 2002 (see also *Stormwater loads from storm drains*). Flow was also estimated for one tributary (Mill Creek) using a stage-discharge relationship. Of all the tributaries, Mill Creek had the highest FC concentrations during both storms, which is consistent with the observation that the highest FC concentrations for the NSSP stations occurred at the mouth of Mill Creek (HH19) (see Tables 15 and Table 11 of TMDL report). NHDES estimated bacteria loading from this tributary during the two storms to be 10 to 26 bill org/day; however, they note that these loadings only include those bacteria counts during the storms and omit additional loadings (potentially higher than during storms) that occur for several days following storms from watershed runoff.

To estimate the significance of loadings from all tributaries relative to loadings from other sources, NHDES assumed loading from each of the other tributaries to be roughly equal to the loading from Mill Creek, so that the total load from all tributaries is estimated to be 68 to 179 bill org/day.

3. Total stormwater loads

As mentioned above (*Stormwater loads from storm drains* and *Stormwater loads from tributaries*), a selected number of stormwater sources (16 of over 100 MS4 sources and one of 7 tributaries) were monitored. In addition to these sources, there is also direct overland stormwater flow to the harbor from developed areas and salt marshes; it is not possible, however, to monitor these sources. Therefore, NHDES used two simple models to estimate the total stormwater load during the two storms. Model results also allowed them to estimate the fraction of the total stormwater load that was captured by monitoring. They were also able to conclude that monitored stormwater sources were only a fraction (10 percent) of the total stormwater sources, and that bacteria contributions from tributaries and overland flow in salt marshes are significant.

3a. Loads from urban stormwater sources

NHDES used a runoff model (the "Hampton Beach runoff model") to estimate the bacteria load generated from stormwater runoff from the developed area of the harbor. First, NHDES used information about the two storms (i.e., storm intensity) and stormwater drainage area (i.e., area, runoff coefficient) to estimate the volume of stormwater runoff. Next, they used data from storm drain monitoring (i.e., average FC concentration), to estimate the total load of bacteria from the Hampton Beach area. This estimate was 65 bill organisms for the July storm and 468 bill orgs for the October storm. Therefore, monitoring captured 55 percent of the stormwater load during the July storm, and 50 percent of the load during the October storm. As NHDES notes, small storm drains and overland flow likely account for the rest of the load.

3b. Loads from all stormwater sources

NHDES developed a "tidal flushing model" by modifying the mass-balance model used to assess dry-weather sources (See "*dry-weather human and wildlife/natural sources*"). The dry-weather model was modified by adding a term to the model to account for total stormwater loads to the harbor (from MS4 storm drains, tributaries, and overland flow). The model was solved for this added term (in billions of organisms per day) by inputting the calculated geomean FC concentrations for various sized storms (calculation described under "*Water quality relative to shellfishing standards*").

This calculation allowed NHDES to conclude that the monitored stormwater load (16 MS4 drains and one tributary) was only about 8 percent of the total stormwater load to the harbor from the July storm (0.33 in storm), and only 11 percent of the total stormwater load from the October storm (1.39 in storm). Estimated stormwater loads from all human and wild-animal sources are given on table 19 of the TMDL report.

4. Comparative loads from all sources

NH's analysis shows that during dry weather, the largest sources of bacteria to the harbor are dry-weather nonpoint sources (87 percent of daily bacteria load), followed by boat discharges (13 percent of load). During wet weather (>1 in precip), the largest sources of bacteria to the harbor are the stormwater load from various stormwater sources (76 percent of daily bacteria load), followed by dry-weather nonpoint sources (21 percent of load), and boat discharges (3 percent of load). The Hampton WWTF only contributes about 0.01 percent of the total annual (dry and wet weather inclusive) bacteria load to the harbor, excluding any emergency bypasses of untreated or partially treated wastewater.

Critical Conditions

Critical conditions are defined as those periods when conditions are conducive to violations in WQSs; defining these conditions can help in identifying actions that may have to be undertaken to meet WQSs. NHDES identified critical conditions for Hampton/Seabrook Harbor as all wet-

weather periods year round and dry-weather periods from June through October.

Total Maximum Daily Load

Using information available on loads from all sources (described above), NHDES calculated the existing annual bacteria load to the harbor at 1,278,515 billion organisms per year. NHDES set the TMDL (i.e., the allowable load of 2021 bill org/day) for the harbor based on the average daily load that exists during dry weather conditions when WQSs (both geomean and 90th percentile FC concentrations) are generally met (unless violated by boat discharges or emergency releases from the WWTF). (Revised Table 21). Overall, loading to the harbor from all sources will need to be reduced by about half to meet the TMDL target. In addition, NHDES calculated the percent reductions in FC concentration needed to achieve the TMDL at each of the 10 NSSP stations. (Revised Table 22).

Assessment: EPA New England agrees that the NSSP stations are representative of water-quality conditions in the central harbor because they surround and overlay the major clam flats in this area and are between any sources and this area. NSSP stations, however, do not represent water-quality conditions in the shoreline area, and additional information and analysis would be necessary before TMDLs could be established for the near-shore areas. The TMDL report did identify some areas near stormwater drains as potential exposure pathways for primary and secondary recreational uses. No measurements of enterococci bacteria (the appropriate water-quality indicator for these uses) are available from either the waterbody or stormwater pipes. Measurements will be taken as part of the monitoring plan for this TMDL to assess this risk (see TMDL review element #8).

EPA New England concludes that NHDES has done a good job in identifying and estimating relative bacteria contributions from all dry and wet weather sources (including point and nonpoint sources) and in identifying critical conditions. We also conclude that NHDES used a reasonable approach to establish a relationship between pollutant loading and water quality. The use of models was appropriate because of the inability to monitor diffuse sources of bacteria (from salt marshes and tributaries), and for showing relative bacteria loads from various sources.

Finally, we agree with NHDES' rationale for setting a TMDL for the central harbor, and for using dry-weather conditions as a basis for this calculation. For clarification, EPA notes that even though a dry-weather condition was used to calculate the TMDL, the TMDL for the central harbor areas applies at all times and weather conditions.

4. Load Allocations (LAs)

EPA regulations require that a TMDL include LAs, which identify the portion of the loading capacity allocated to existing and future nonpoint sources and to natural background (40 C.F.R. § 130.2(g)). Load allocations may range from reasonably accurate estimates to gross allotments (40 C.F.R. § 130.2(g)). Where it is possible to separate natural background from nonpoint sources, load allocations should be described separately for background and for nonpoint sources.

If the TMDL concludes that there are no nonpoint sources and/or natural background, or the TMDL recommends a zero load allocation, the LA must be expressed as zero. If the TMDL recommends a zero LA after considering all pollutant sources, there must be a discussion of the reasoning behind this decision, since a zero LA implies an allocation only to point sources will result in attainment of the applicable water quality standard, and all nonpoint and background sources will be removed.

Load allocations (LAs) identify the portion of the loading capacity allocated to existing and future nonpoint sources, non-NPDES point sources and natural background, and may range from reasonably accurate estimates to gross allotments. As discussed above, NHDES defined three categories of nonpoint sources (and non-NPDES point sources) to Hampton/Seabrook Harbor: dry-weather nonpoint sources, stormwater nonpoint sources, and boat discharges.

An overall LA of 1738 bill orgs/day was calculated by subtracting the Wasteload Allocation (WLA) for point sources and a 10 percent Margin of Safety (MOS) from the total allowable load. The existing nonpoint-source and non-NPDES point source loads from three source categories (1784 bill org/day from dry-weather sources, 1332 bill org/day from stormwater, and 238 bill org/day from boats) will need to be reduced by about 50 percent to achieve the target LA.

Assessment: NHDES took a reasonable approach in establishing a gross LA. In response to EPA comments, NHDES adequately explained the basis for not refining the LA based on source categories (e.g., boat discharges). NH DES has done a good job in attempting to separate natural background from human sources; this information will be useful for identifying control actions that NHDES can undertake to reduce bacteria loading to the harbor.

5. Wasteload Allocations (WLAs)

EPA regulations require that a TMDL include WLAs, which identify the portion of the loading capacity allocated to existing and future point sources (40 C.F.R. § 130.2(h)). If no point sources are present or if the TMDL recommends a zero WLA for point sources, the WLA must be expressed as zero. If the TMDL recommends a zero WLA after considering all pollutant sources, there must be a discussion of the reasoning behind this decision, since a zero WLA implies an allocation only to nonpoint sources and background will result in attainment of the applicable water quality standard, and all point sources will be removed.

In preparing the wasteload allocations, it is not necessary that each individual point source be assigned a portion of the allocation of pollutant loading capacity. When the source is a minor discharger of the pollutant of concern or if the source is contained within an aggregated general permit, an aggregated WLA can be assigned to the group of facilities. But it is necessary to allocate the loading capacity among individual point sources as necessary to meet the water quality standard.

The TMDL submittal should also discuss whether a point source is given a less stringent wasteload allocation based on an assumption that nonpoint source load reductions will occur. In such cases, the State/Tribe will need to demonstrate reasonable assurance that the nonpoint

source reductions will occur within a reasonable time.

Wasteload allocations (WLAs) identify the portion of the loading capacity allocated to existing and future point sources that are subject to the NPDES permit program. As discussed above, NHDES defined two categories of point sources to Hampton/Seabrook Harbor: facilities with individual NPDES permits (the HamptonWWTF, Aquatic Research Organisms, Inc., and Envirosystems, Inc.), and the stormwater discharges from MS4s (now subject to a general NPDES permit). In its revised submission NHDES also included illicit connections on the WLA side of the TMDL equation, and assigned an allocation of zero.

Annual bacteria loads from these point sources were estimated for each of these source categories (also see TMDL Review Element #3). NHDES calculated the maximum allowable bacteria loading from the Hampton WWTF based on the facility's NPDES permit and its largest possible flow. NHDES used recent (2002) stormwater-monitoring data and a runoff model to estimate the bacteria load generated from stormwater runoff from the developed area of the harbor.

NHDES calculated a WLA (80 bill orgs/day) for the harbor. This WLA represents about 4 percent of the TMDL (consistent with the proportion of loads from point sources to loads from nonpoint sources shown on Table 21 of the TMDL report), and includes an allocation of 7.7 bill org/day for the Hampton WWTF, 0.024 bill org/day for Aquatic Research Organisms, Inc., and 0.007 bill org/day for Envirosystems, Inc. The remaining 72 bill org/day is allocated to MS4 stormwater discharges (with an allocation of zero for illicit connections).

Assessment: EPA New England concludes that the WLAs established in the TMDL are reasonable. To satisfy the WLAs, illicit connections will have to be eliminated, and Phase II MS4 stormwater discharges will need to reduce existing loads by slightly less than 50%.

6. Margin of Safety (MOS)

The statute and regulations require that a TMDL include a margin of safety to account for any lack of knowledge concerning the relationship between load and wasteload allocations and water quality (CWA § 303(d)(1)(C), 40 C.F.R. § 130.7(c)(1)). EPA guidance explains that the MOS may be implicit, i.e., incorporated into the TMDL through conservative assumptions in the analysis, or explicit, i.e., expressed in the TMDL as loadings set aside for the MOS. If the MOS is implicit, the conservative assumptions in the analysis that account for the MOS must be described. If the MOS is explicit, the loading set aside for the MOS must be identified.

A MOS accounts for any lack of knowledge concerning the relationship between pollutant loadings and water quality. NHDES provided an explicit MOS equal to 10 percent of the TMDL for the harbor to account for any data gaps.

Assessment: Adequately addressed.

7. Seasonal Variation

The statute and regulations require that a TMDL be established with consideration of seasonal variations. The method chosen for including seasonal variations in the TMDL must be described (CWA § 303(d)(1)(C), 40 C.F.R. § 130.7(c)(1))

Assessment: Data from the critical periods (wet-weather periods year round and dry-weather periods from June through October) were used to estimate bacteria loads to the harbor. The total load to the harbor during dry weather was used as the TMDL because WQSs are currently only met during dry weather. Therefore, this TMDL should result in attainment of WQSs during critical conditions. Because the TMDL is set to be protective even during these critical periods, the TMDL is considered to be protective of all seasons.

8. Monitoring Plan for TMDLs Developed Under the Phased Approach

EPA's 1991 document, Guidance for Water Quality-Based Decisions: The TMDL Process (EPA 440/4-91-001), recommends a monitoring plan when a TMDL is developed under the phased approach. The guidance recommends that a TMDL developed under the phased approach also should provide assurances that nonpoint source controls will achieve expected load reductions. The phased approach is appropriate when a TMDL involves both point and nonpoint sources and the point source is given a less stringent wasteload allocation based on an assumption that nonpoint source load reductions will occur. EPA's guidance provides that a TMDL developed under the phased approach should include a monitoring plan that describes the additional data to be collected to determine if the load reductions required by the TMDL lead to attainment of water quality standards.

NHDES will use data from NSSP stations (in accordance with NSSP protocols) to assess progress towards meeting WQSs for shellfishing in the central harbor. They will also use data from four National Coastal Assessment stations (collected monthly from April through December) to assess progress toward meeting WQSs for primary and secondary contact recreation. In addition, NHDES will collect sample stormwater and near-shore waters for analysis of compliance with enterococci standards for primary and secondary contact recreation.

In some cases, NHDES plans to do monitoring before and following actions intended to reduce bacteria loads from various sources (e.g., storm drains).

Assessment: Adequately addressed. If monitoring indicates that violations of WQSs continue to occur in the central harbor areas, the TMDL will be revised accordingly.

9. Implementation Plans

On August 8, 1997, Bob Perciasepe (EPA Assistant Administrator for the Office of Water) issued a memorandum, "New Policies for Establishing and Implementing Total Maximum Daily Loads (TMDLs)," that directs Regions to work in partnership with States/Tribes to achieve nonpoint source load allocations established for 303(d)-listed waters impaired solely or primarily by nonpoint sources. To this end, the memorandum asks that Regions assist States/Tribes in developing implementation plans that include reasonable assurances that the

nonpoint source load allocations established in TMDLs for waters impaired solely or primarily by nonpoint sources will in fact be achieved. The memorandum also includes a discussion of renewed focus on the public participation process and recognition of other relevant watershed management processes used in the TMDL process. Although implementation plans are not approved by EPA, they help establish the basis for EPA's approval of TMDLs.

NHDES has developed an implementation plan with the goal of removing all human sources of bacteria to the harbor. This plan includes follow-up monitoring both in the harbor and at specific sources to evaluate the effectiveness of control actions, to identify any new sources, and to do any needed risk assessments

DES plans to work with the towns of Hampton and Seabrook to develop projects to reduce bacteria loads to the harbor. A preliminary list of possible projects includes:

-Use wet-weather loading data from the TMDL study to prioritize storm drains for remedial actions.
-Identify and eliminate any illicit connections to storm drains
-Promote use of nonstructural BMPs (e.g., street sweeping, pet-waste ordinances, catch-basin stenciling)
-Assist EPA in implementing federal Phase II Stormwater regulations.
-Expand use of boat sewage-pumpout facilities
-Pursue a "no discharge area" designation for the New Hampshire coast
-Promote public education about septic-system maintenance
-Conduct a shoreline survey of Mill Creek to identify bacteria sources
-Implement recommendations of NHEP/UNH study of wastewater discharges due to runoff-induced overloading or exfiltration due to aging infrastructure
-Develop more accurate measurements of bacteria loads from tidal tributaries

Assessment: Although NHDES is not required to include an implementation plan as part of their TMDL submittal, EPA New England thinks that NHDES has done an admirable job in developing and targeting steps to achieve the TMDL.

10. Reasonable Assurances

EPA guidance calls for reasonable assurances when TMDLs are developed for waters impaired by both point and nonpoint sources. In a water impaired by both point and nonpoint sources, where a point source is given a less stringent wasteload allocation based on an assumption that nonpoint source load reductions will occur, reasonable assurance that the nonpoint source reductions will happen must be explained in order for the TMDL to be approvable. This information is necessary for EPA to determine that the load and wasteload allocations will achieve water quality standards.

In a water impaired solely by nonpoint sources, reasonable assurances that load reductions will be achieved are not required in order for a TMDL to be approvable. However, for such nonpoint source-only waters, States/Tribes are strongly encouraged to provide reasonable

assurances regarding achievement of load allocations in the implementation plans described in section 9, above. As described in the August 8, 1997 Perciasepe memorandum, such reasonable assurances should be included in State/Tribe implementation plans and "may be non-regulatory, regulatory, or incentive-based, consistent with applicable laws and programs."

The individual WLAs for the three wastewater discharges are based on criteria end-of-pipe. The discharges from these sources are negligible in comparison to other sources, and the WLAs do not rely on assumptions about NPS reductions. NHDES has provided an implementation plan for reducing loads from MS4s as well as nonpoint sources, boats, and illicit connections. NHDES expects many of these measures and BMPs to be implemented on a voluntary basis. In some cases, NHDES has enforcement authority to ensure that implementation occurs.

Assessment: Adequately addressed.

11. Public Participation

EPA policy is that there must be full and meaningful public participation in the TMDL development process. Each State/Tribe must, therefore, provide for public participation consistent with its own continuing planning process and public participation requirements (40 C.F.R. § 130.7(c)(1)(ii)). In guidance, EPA has explained that final TMDLs submitted to EPA for review and approval must describe the State/Tribe's public participation process, including a summary of significant comments and the State/Tribe's responses to those comments. When EPA establishes a TMDL, EPA regulations require EPA to publish a notice seeking public comment (40 C.F.R. § 130.7(d)(2)).

Inadequate public participation could be a basis for disapproving a TMDL; however, where EPA determines that a State/Tribe has not provided adequate public participation, EPA may defer its approval action until adequate public participation has been provided for, either by the State/Tribe or by EPA.

Assessment: NHDES worked closely with Hampton and Seabrook town officials during development of the TMDL. TMDL was made available for public comment between June 1 and August 1, 2003 on the NHDES website. DES did not receive any public comments on the report. EPA New England concludes that NHDES has done an adequate job of involving the public during the development of the TMDL report for Hampton/Seabrook Harbor, and has provided adequate opportunity for public comment.

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